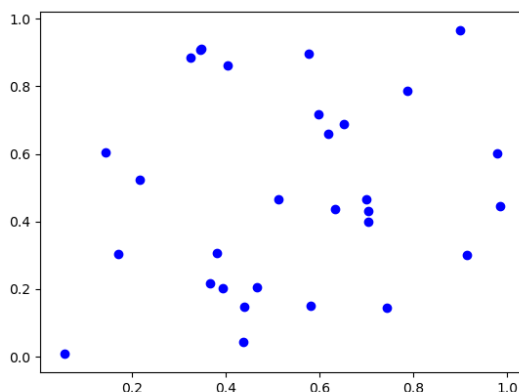


This key should allow you to understand why you choose the option you did (beyond just getting a question right or wrong). More instructions on how to use this key can be found [here](#).

If you have a suggestion to make the keys better, please fill out the short survey [here](#).

Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

1. Determine the appropriate model for the graph of points below.



The solution is None of the above, which is option E.

- A. Exponential model

For this to be the correct option, we want an extremely slow change early, then a rapid change later.

- B. Linear model

For this to be the correct option, we need to see a mostly straight line of points.

- C. Logarithmic model

For this to be the correct option, we want a rapid change early, then an extremely slow change later.

- D. Non-linear Power model

For this to be the correct option, we need to see a polynomial or rational shape.

- E. None of the above

For this to be the correct option, we want to see no pattern in the points.

General Comment: This question is testing if you can associate the models with their graphical representation. If you are having trouble, go back to the corresponding Core module to learn about the specific function you are having trouble recognizing.

2. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$.

Pringles wants to add 31 percent more chips to their cylinder cans and minimize the design change of their cans. They've decided that the best way to minimize the design change is to increase the radius and height by the same percentage. What should this increase be?

The solution is About 9 percent, which is option A.

A. About 9 percent

* This is the correct option.

B. About 3 percent

This corresponds to not solving for the increase properly.

C. About 14 percent

This corresponds to solving correctly but treating both radius and height as equal contributors to the volume.

D. About 16 percent

This corresponds to treating both radius and height as equal contributors and not solving correctly.

E. None of the above

If you chose this, please contact the coordinator to discuss how you solved the problem.

General Comment: Remember that when plugging the increases of values in, you need to treat it as that percentage above 100. For example, a 5 percent increase means 105 percent.

3. Solve the modeling problem below, if possible.

A new virus is spreading throughout the world. There were initially 3 many cases reported, but the number of confirmed cases has tripled every 5 days. How long will it be until there are at least 10000 confirmed cases?

The solution is About 37 days, which is option A.

A. About 37 days

* This is the correct option.

B. About 41 days

You modeled the situation with e as the base, but solved correctly otherwise.

C. About 22 days

You modeled the situation with e as the base and did not apply the properties of log correctly.

D. About 21 days

You modeled the situation correctly but did not apply the properties of log correctly.

E. There is not enough information to solve the problem.

If you chose this option, please contact the coordinator to discuss why you think this is the case.

General Comment: Set up the model the same as in Module 11M. Then, plug in 10000 and solve for d in your model.

4. Solve the modeling problem below, if possible.

In CHM2045L, Brittany created a 28 liter 19 percent solution of chemical χ using two different solution percentages of chemical χ . When she went to write her lab report, she realized she forgot to write the amount of each solution she used! If she remembers she used 5 percent and 27 percent solutions, what was the amount she used of the 5 percent solution?

The solution is 10.18liters, which is option B.

A. 17.82liters

This is the concentration of 27 percent solution.

B. 10.18liters

*This is the correct option.

C. 14.00liters

This would be correct if Brittany used equal parts of each solution.

D. 11.65liters

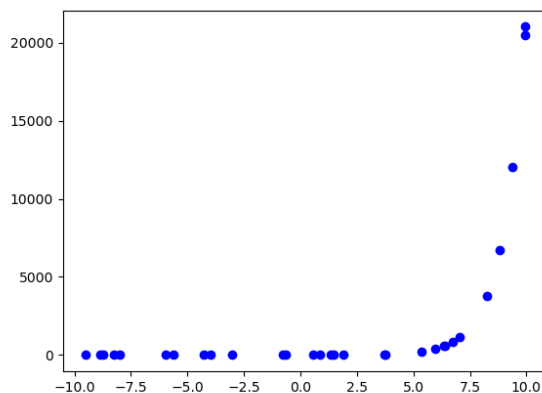
This was a random value. If this was not a guess, contact the coordinator to talk about how you got this value.

E. There is not enough information to solve the problem.

You may have chose this if you thought you needed to know how much of the second solution was used in the problem. Remember that the total minus the first solution would give you the second amount used.

General Comment: Build the model exactly as you did in Module 9M. Then, solve for the volume you are looking for.

5. Determine the appropriate model for the graph of points below.



The solution is Exponential model, which is option D.

A. Non-linear Power model

For this to be the correct option, we need to see a polynomial or rational shape.

B. Linear model

For this to be the correct option, we need to see a mostly straight line of points.

C. Logarithmic model

For this to be the correct option, we want a rapid change early, then an extremely slow change later.

D. Exponential model

For this to be the correct option, we want an extremely slow change early, then a rapid change later.

E. None of the above

For this to be the correct option, we want to see no pattern in the points.

General Comment: This question is testing if you can associate the models with their graphical representation. If you are having trouble, go back to the corresponding Core module to learn about the specific function you are having trouble recognizing.

6. The temperature of an object, T , in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T , based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 100°C and is placed into a 10°C bath to cool. After 21 minutes, the uranium has cooled to 37°C .

The solution is None of the above, which is option E.

A. $k = -0.02800$

This uses A as the initial temperature and solves for k incorrectly.

B. $k = -0.02854$

This uses A correctly and solves for k incorrectly.

C. $k = -0.06235$

This uses A as the initial temperature and solves for k correctly.

D. $k = -0.04752$

This uses A as the bath temperature and solves for k incorrectly.

E. None of the above

* This is the correct answer as $k = -0.05733$.

General Comment: The initial temperature is when $t = 0$. Unlike power models, that means A is not the initial temperature!

7. Solve the modeling problem below, if possible.

A new virus is spreading throughout the world. There were initially 8 many cases reported, but the number of confirmed cases has doubled every 2 days. How long will it be until there are at least 1000000 confirmed cases?

The solution is About 34 days, which is option B.

A. About 10 days

You modeled the situation correctly but did not apply the properties of log correctly.

B. About 34 days

* This is the correct option.

C. About 24 days

You modeled the situation with e as the base, but solved correctly otherwise.

D. About 9 days

You modeled the situation with e as the base and did not apply the properties of log correctly.

E. There is not enough information to solve the problem.

If you chose this option, please contact the coordinator to discuss why you think this is the case.

General Comment: Set up the model the same as in Module 11M. Then, plug in 1000000 and solve for d in your model.

8. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate (*rounded to the nearest minute*) replication rate of bacteria- α .

A newly discovered bacteria, α , is being examined in a lab. The lab started with a petri dish of 3 bacteria- α . After 1 hours, the petri dish has 15 bacteria- α . Based on similar bacteria, the lab believes bacteria- α doubles after some undetermined number of minutes.

The solution is None of the above, which is option E.

A. About 286 minutes

This uses the wrong base, does not solve for the constant correctly, AND converted incorrectly.

B. About 238 minutes

This uses the wrong base and solves for the constant correctly but converted incorrectly.

C. About 47 minutes

This uses the wrong base and does not solve for the constant correctly.

D. About 39 minutes

This uses the wrong base.

E. None of the above

* This is the correct option as all other options used the wrong base in their model.

General Comment: Your model should be $P(t) = P_0(b)^{kt}$, where $P(t)$ is the population at some time t , P_0 is the initial population, and k is the replication rate. Be sure you convert the hours into minutes!

9. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$.

Pringles wants to add 38 percent more chips to their cylinder cans and minimize the design change of their cans. They've decided that the best way to minimize the design change is to increase the radius and height by the same percentage. What should this increase be?

The solution is About 11 percent, which is option C.

A. About 19 percent

This corresponds to treating both radius and height as equal contributors and not solving correctly.

B. About 17 percent

This corresponds to solving correctly but treating both radius and height as equal contributors to the volume.

C. About 11 percent

* This is the correct option.

D. About 3 percent

This corresponds to not solving for the increase properly.

E. None of the above

If you chose this, please contact the coordinator to discuss how you solved the problem.

General Comment: Remember that when plugging the increases of values in, you need to treat it as that percentage above 100. For example, a 5 percent increase means 105 percent.

10. Solve the modeling problem below, if possible.

In CHM2045L, Brittany created a 29 liter 21 percent solution of chemical χ using two different solution percentages of chemical χ . When she went to write her lab report, she realized she forgot to write the amount of each solution she used! If she remembers she used 19 percent and 31 percent solutions, what was the amount she used of the 31 percent solution?

The solution is 4.83liters, which is option A.

A. 4.83liters

*This is the correct option.

B. 24.17liters

This is the concentration of 19 percent solution.

C. 10.44liters

This was a random value. If this was not a guess, contact the coordinator to talk about how you got this value.

D. 14.50liters

This would be correct if Brittany used equal parts of each solution.

E. There is not enough information to solve the problem.

You may have chose this if you thought you needed to know how much of the second solution was used in the problem. Remember that the total minus the first solution would give you the second amount used.

General Comment: Build the model exactly as you did in Module 9M. Then, solve for the volume you are looking for.
